DTIC FILE COPY

AD-A225 485

The Tactical Center of Gravity: How Useful is the Concept?

A Monograph
by

Major Michael T. Inman
Aviation

DTIC
ELECTE
AUG 21 1990
S D
b D

School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas

First Term AY 89/90

Approved for Public Release; Distribution is Unlimited

90-3176

90 08 20 051

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION: Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT: Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION: School of Advanced Military Studies, USACGSC / 6b. OFFICE SYMBOL (If applicable): ATZL-SWZ	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code): Fort Leavenworth, Kansas 66027	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION / 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS: PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
THE TACTICAL CENTER OF GRAVITY: How Useful is the Concept? (Unclassified)

12. PERSONAL AUTHOR(S)
Major Michael T. Inman, USA

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Monograph	FROM _____ TO _____	90,01,06	59

16. SUPPLEMENTARY NOTATION

17. COSATI CODES		
FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
center of gravity, Clausewitz, theory, Decisive Points, Schwerpunkt, main effort, synchronization, vulnerabilities, airland battle, Schmidt, Falklands War

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The 1986 edition of Field Manual (FM) 100-5, Operations, introduced a theoretical basis to AirLand Battle, the U.S. Army's basic warfighting doctrine. One of the new concepts introduced into the doctrine was "center of gravity." The manual indicated the concept had little utility at the tactical level.

This study examined the origin, definition (original and current), and tactical applicability of the theoretical concept "center of gravity" and the related concepts of "schwerpunkt" and "main effort." The study examined the Battles of Schmidt (1944) and East Falkland (1982) to determine the utility of the concept of a tactical center of gravity.

The conclusion of the study is that the concept is of use to the tactical commander only if the classical definition of center of gravity as a concentration of force or source of power is used. The concept is already embodied in the doctrine in the term "main effort." That term is not universally understood or applied in the doctrine. (see over)

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	Unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
Major Michael T. Inman	(913)-684-2138	ATZL-SWC

DD Form 1473, JUN 86 — Previous editions are obsolete. — SECURITY CLASSIFICATION OF THIS PAGE: UNCLASSIFIED

Block 19 Continued.

The study recommends that FM 100-5 be changed to reflect a narrower interpretation of the term "center of gravity," and that the tactical utility of the concept be recognized. It also recommends that a standard definition for the term "main effort" be developed and included in all derivative tactical and operational level doctrine manuals.

ABSTRACT

THE TACTICAL CENTER OF GRAVITY: How Useful is the Concept? by Major Michael T. Inman, USA, 40 pages.

The 1986 edition of Field Manual (FM) 100-5, *Operations*, introduced a theoretical basis to AirLand Battle, the U.S. Army's basic fighting doctrine. One of the new concepts introduced into the doctrine was "center of gravity." The manual indicated the concept had little utility at the tactical level.

This study examined the origin, definition (original and current), and tactical applicability of the theoretical concept "center of gravity" and the related concepts of "schwerpunkt," and "main effort." The study examined the Battles of Schmidt (1944) and East Falkland (1982) to determine the utility of the concept of a tactical center of gravity.

The conclusion of the study is that the concept is of use to the tactical commander only if the classical definition of center of gravity as a concentration of force or source of power is used. The concept is already embodied in the doctrine in the term "main effort." That term is not universally understood or applied in the doctrine.

The study recommends that FM 100-5 be changed to reflect a narrower interpretation of the term "center of gravity," and that the tactical utility of the concept be recognized. It also recommends that a standard definition for the term "main effort" be developed and included in all derivative tactical and operational level doctrine manuals.

Accesion For
NTIS CRA&I ☑
DTIC TAB ☐
Unannounced ☐
Justification
By
Distribution /
Availability Codes
Dist | Avail and/or Special
A-1

TABLE OF CONTENTS

ABSTRACT iii

TABLE OF CONTENTS iv

CHAPTER 1. INTRODUCTION 1
The Research Question 1
Why Study Center of Gravity 4

CHAPTER 2. CLAUSEWITZ'S CENTER OF GRAVITY 5
Origin of Center of Gravity 5
The Physical Analogy 6
Clausewitz's Definitions 6

CHAPTER 3. RELATED THEORIES AND INTERPRETATION . . . 8
Jomini's Decisive Points 8
The German *Schwerpunkt* 10
Soviet Doctrine 13
USMC Doctrine 14

CHAPTER 4. THEORY IN U. S. ARMY DOCTRINE 15
Early Influence of Theory and The Principles of War 15
Main Effort 17
Vulnerabilities 21
Synchronization 22
Center of Gravity 23

CHAPTER 5. HISTORICAL CASE STUDIES 24
The Battle of Schmidt 24
The Battle for East Falkland 29

CHAPTER 6. TACTICAL CENTER OF GRAVITY IN AIRLAND BATTLE 32
A Working Definition 32
The Concept in AirLand Battle 34

CHAPTER 7. CONCLUSIONS AND RECOMMENDATIONS 38

MAP 1. BATTLE OF SCHMIDT 41

MAP 2. BATTLE OF EAST FALKLAND 42

ENDNOTES 43

BIBLIOGRAPHY 51

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Michael T. Inman

Title of Monograph: The Tactical Center of Gravity: How Useful is the Concept?

Approved by:

James J. Schneider, MA — Monograph Director

Colonel William H. Janes, MA, MMAS — Director, School of Advanced Military Studies

Philip J. Brookes, Ph.D. — Director, Graduate Degree Program

Accepted this 26th day of March 1990

The Tactical Center of Gravity: How useful is the concept?

CHAPTER 1. INTRODUCTION

> [Theory] is meant to educate the mind of the future commander, or, more accurately, to guide him in his self-education, not to accompany him to the battlefield. . . .
>
> Carl von Clausewitz[1]

The Research Question . . .

The 1986 edition of Field Manual (FM) 100-5, *Operations*, introduced a theoretical basis to AirLand Battle, the U.S. Army's basic fighting doctrine. Center of gravity was introduced into the doctrine as one of three concepts "central to the design and conduct of campaigns and major operations . . . ,"[2] and therefore important to operational art. The new manual highlighted the importance of the concept of center of gravity, calling its identification and destruction "the essence of operational art."[3]

While military theorists have long influenced officer education, doctrine, and military training in the U.S. Army,[4] the 1986 edition of FM 100-5 is the first attempt to incorporate theoretical concepts directly into the doctrine. The significance attached to these concepts for operational art by the new FM 100-5 makes them important topics for study.

The emphasis placed on theoretical concepts, particularly center of gravity, in the new manual generated healthy debate on the doctrine and its theoretical background. This discussion continues

today.[5] Much of the argument concerns the definition of the term center of gravity. Prussian General Carl von Clausewitz, who used the term in his classical work *Vom Krieg*, or *On War*, was inconsistent and imprecise in his use and definition of the term center of gravity. He uses the term to describe a blow, a concentration of force, cohesion, and battle.[6] In one instance he clearly states there can be only one center of gravity; in other places he seems to imply there can be more than one.[7] FM 100-5 also lacks precision in the use of the term.[8]

Another aspect of the debate is the question of the utility of the concept of center of gravity at the tactical level. FM 100-5 states that while '[t]actical formations can and frequently will have centers of gravity[,] . . . the concept is more usually and usefully applied to larger forces at the operational level. . . .'[9] Given the importance attached to center of gravity at the operational level of war, it would seem that if there is any utility at the tactical level it should be identified and exploited.

Before we can really determine if the concept is useful for tactical commanders, we must reach an understanding of what 'center of gravity' is, and why it is in the doctrine. While we should not be bound by a theoretical definition of the term that might limit the use of it in our doctrine, FM 100-5 refers readers to classical operational theory for detailed explanation of the concept. Further, the manual uses Clausewitz's definitions for the term.[10] This makes the theoretical base the start point for any study of center of gravity.

An analysis of recent writings on center of gravity will quickly lead to two conclusions. First, there is not a lot of agreement at any level on what the term 'center of gravity' means. Second, virtually all current thought on the subject is aimed at the operational and strategic levels. Little thought has been given to the application of the concept at the tactical level.

This study will examine the origin, definition (original and current), and tactical applicability of the theoretical concept 'center of gravity'. It will look at the historical and current understanding of the term in tactics, and, where necessary for understanding, in operational art. It will examine related theoretical and doctrinal concepts and principles of war.

The study will examine the Battle of Schmidt (1944) and the Battle of East Falkland (1982) to determine the following: were there identifiable centers of gravity on both sides that met the definition of center of gravity; could they be targeted; were they targeted; if targeted, what was the effect; and would the concept have helped the tactical commanders in the battle. The study will attempt to reach conclusions about the applicability of the concept to the tactical level of war, and make recommendations for revision of U.S. Army doctrine.

Throughout this study the terms strategy, operational art and tactics and the related levels of war will be used. For clarity the definitions of these terms from FM 100-5 are included. Strategy refers to the employment of armed forces of a nation to secure political objectives. Operational art refers to the use

of armed forces to achieve strategic goals, and is concerned with planning and conducting campaigns and major operations. Tactics refers to the methods used by corps and smaller unit commanders to win battles and engagements.[11]

Why Study Center of Gravity . . .

There is a tendency to try to make Clausewitz a panacea, what one writer calls a "rosetta stone,"[12] for everything we perceive to be wrong with our doctrine. Such phrases as the "essence of operational art"[13] attached to a concept as ambiguous as center of gravity are a reflection of this tendency. Even Clausewitz did not have one set definition in mind for the term. Given the seemingly contradictory definitions of center of gravity, one must attempt to resolve them. We know Clausewitz was using an analogy. He tells us that himself.[14] Some have said we should not base our doctrine on an analogy. This is true enough. However, Clausewitz thought this analogy was very important. His emphasis warrants further study.

In his discussion of war plans Clausewitz says the first principle of strategic planning "is that the ultimate substance of enemy strength must be traced back to the fewest sources, and ideally to one alone."[15] This principle is to serve as a guide for other considerations. If we accept that Clausewitz's theories are important to the successful conduct of war, we cannot ignore the principle he considered most important in planning.

CHAPTER 2. CLAUSEWITZ'S CENTER OF GRAVITY

> There are in Europe many good generals, but they see too many things at once. I see only one thing, namely the enemy's main body. I try to crush it, confident that secondary matters will then settle themselves.
>
> Napoleon[16]

Origin of Center of Gravity . . .

Center of gravity, in its military context, is a translation of the German term, *schwerpunkt*, taken from the Clausewitz's *On War*. The word comes from the German words *schwer*, meaning heavy, and *der punkt*, meaning point or spot.[17] *Schwerpunkt* can be translated in a number of ways. In physics it literally means 'center of gravity', the point at which gravitational pull is equal in all directions. Figuratively it can mean emphasis or focal point. In current German military use it means 'point of main effort.' The idea of concentrating or 'building a main effort' is expressed in German as *schwerpunktbildung*.[18]

Clausewitz took the term *schwerpunkt* from physics, no doubt reflecting the high level of interest in that subject during the period in which he lived. Dr. Dan Hughes, U.S. Army Combined Arms Center Historian, believes that the term *schwerpunkt* was so commonly used as to have been a slang term during this period. He also suggests that Clausewitz may not have been the first to use the term in a military context as many of his works were written to refute contemporary and earlier theorists.[19]

The Physical Analogy . . .

Clausewitz's interest in physics accounts for what Mr. James J. Schneider and Lawrence L. Izzo call his 'mechanistic view of war.'[20] It also explains the use of the analogy of physical force that is common throughout his work. He defined war itself in terms of physics, calling it an 'act of force to compel our enemy to do our will.'[21]

A frequent complaint about *On War* is the inconsistency of Clausewitz's use of 'center of gravity'. Clausewitz was using an analogy, similar in some respects, very different in others, to explain the complex phenomenon of war.[22] He compared war to a duel, but on a larger scale. War to him was like a pair of wrestlers, each trying 'through physical force to compel the other to do his will; his immediate aim is to throw his opponent in order to make him incapable of further resistance.'[23] The key to success was to cause the opponent to lose his balance.

Clausewitz's Definitions . . .

Clausewitz's center of gravity was the main concentration of forces. He said the blow that would produce the best results was the one that hit the area of the 'greatest concentration of enemy troops.'[24] Clausewitz used the term *schwerpunktbildung* to describe the concentration of force a friendly army would use against an enemy, and to describe the target at which that force, or blow, should be aimed. Clausewitz said, '[a] center of gravity is always found where the mass is concentrated most densely.'[25]

Clausewitz thought cohesion of the belligerent could be a center of gravity. He said, "[w]here there is cohesion, the analogy of the center of gravity can be applied."[26] He linked this idea back to the main concentration of the forces, saying it is here that the "centers of gravity will be found."[27] Although he implied at times that there could be more than one center of gravity, Clausewitz states emphatically in Book Six that "a *single* center of gravity can be identified."[28]

His use of the term in Book Eight is less precise. In a much quoted passage, he calls the center of gravity "the hub of all power and movement, on which everything depends."[29] He goes on to indicate by examples what that "hub of all power" might be; the army, the capital, a protector, common interests among allies, popular leaders, and public opinion.[30]

Clausewitz's uses of "center of gravity" in these instances have a consistent theme; "center of gravity" is a source of strength. Not so in Book Four. Here Clausewitz applied the analogy to a discussion on the relationship between battle and war. He said, "the battle must always be considered as the true center of gravity of the war".[31] It is evident that Clausewitz did not have one definition for the term center of gravity. Unfortunately, he did not resolve the issues raised with his contradictory and confusing definitions of the term.

Clausewitz left a number of other points unresolved. He was unclear about whether the tactical center of gravity is always the forces.[32] He also, as already mentioned, was unclear on the issue of whether there can

be more than one center of gravity (the analogy would seem invalid if there can be more than one).

CHAPTER 3. RELATED THEORIES AND INTERPRETATION

> An attack without *Schwerpunkt* is like a man without character.[33]
>
> Field Marshal Paul von Hindenburg

Jomini's Decisive Points . . .

A study of Clausewitz's center of gravity would be incomplete without a comparison of his concept and Jomini's decisive points. Antoine-Henri Baron de Jomini was a contemporary and rival of sorts to Clausewitz. Their approach to war, however, was very different. Clausewitz believed the conduct of war was an art; Jomini viewed it as a scientific endeavor.

Jomini believed the conduct of war could be reduced to a few rules. He "proposed to show that there was one great principle underlying all the operations of war . . . ."[34] This principle, expressed in four maxims in his book *The Art of War*, articulates his concept of decisive points.

Jomini's first maxim called for throwing by "strategic movements" a concentrated force upon the "decisive points of a theater of war", while protecting one's own decisive points. His second point was to "maneuver to engage fractions of the hostile army with the bulk of one's force." The third point called for hitting the portion of the enemy's line which was of the most importance to overthrow. The fourth point was to hit the decisive point with the masses at the proper time.[35] To Jomini a decisive point was a ". . . physical

objective for which we are willing to expend combat power.'[36]

Clausewitz also wrote about decisive points. He does not define his decisive point, but his writings make it evident that he saw the decisive point as some element of the enemy force. Clausewitz saw the battle as a meeting of the mass of two armies, with '[d]estruction of the enemy forces . . . the overriding principle of war. . . . Only great engagements involving all forces lead to major success.'[37]

While he acknowledged that superiority of numbers was only one factor that determines victory, even citing examples where great commanders had won battles with inferior numbers, Clausewitz did not believe you should count on being able to fight outnumbered and win. He said, '. . . as many troops as possible should be brought into the engagement at the decisive point.'[38]

Clausewitz said that '. . . a main factor is the possession of strength at the really vital point . . . . To achieve strength at the decisive point depends on the strength of the army and on the skill with which this strength is employed.'[39] A good description of the application of the concept of decisive points in Napoleonic warfare comes from Colonel Hermann Foertsch's *The Art of Modern Warfare*.

> Napoleon's new tactics called for the formation of masses at the decisive spot, together with artillery and the shock of his infantry attack. This necessitated feeling out the enemy's front, either before or in the early stages of the battle, to find his weakest point. After that, it was a matter of forcing the breach by weight of fire and main force. Never to divide his forces, but to apply all his strength at

> the critical point was the principle on which Napoleon's tactics were built up.[40]

A fundamental difference between the two theorists is that while Clausewitz emphasized mass against an enemy force, Jomini stressed concentration at locations on the battlefield. Jomini described two types of decisive points; geographic and accidental points of maneuver. Geographic decisive points were commanding terrain features or lines which gave the possessor an advantage. Accidental points of maneuver 'result from the positions of the troops on both sides.'[41] He said,

> . . . decisive points of maneuver are on that flank of the enemy upon which, if his opponent operates, he can more easily cut him off from his base and supporting forces without being exposed to the same danger.[42]

For Clausewitz the decisive point was the battle or engagement with a mass of the enemy force. For Jomini, it was an objective, either terrain or a vulnerable component of the enemy forces.

The German *Schwerpunkt* . . .

During the early part of the 19th Century, Jomini's influence on military theory and practice was predominant, particularly outside of Germany. By the later part of the century Clausewitz's ideas had achieved equal acceptance in most western armies. In the German Army in particular, Clausewitz was widely read and interpreted.

The German Army gave a different meaning to Clausewitz's *schwerpunkt*. They used the term to mean 'point of main effort.' Field Marshal Erwin Rommel's record of his exploits in World War I gives many examples

of the use of the main effort. In *Attacks* he described the infiltration tactics used by the Germans towards the end of that war. At the Battle of Isonzol (Caporreta), Italy, in October 1917, Rommel's detachment attacked the Kuk garrison by combining heavy artillery fires, a supporting attack, and a main attack of 3 rifle and 3 machine gun companies.

> The detachment first attacked only with two assault teams of 16 men each under the fire support of one machine gun company, six light machine guns, and two heavy batteries. These teams felt out the possibilities of approaching the enemy and I then used the main body to encircle the entire Kuk garrison. . . .[43]

The '*point of main effort*' was a key component to the German Blitzkrieg of 1940. General Guderian articulated the reasoning behind it in *The Infantry Journal* in 1937. '[T]he increasing effectiveness of the anti-tank defense calls for the utmost concentration of force on the part of the mechanized arm if desired results are to be obtained.'[44]

Colonel Foertsch described how the concept of *schwerpunkt* was applied to German tactics. He said that every attack had to have a focal point (*schwerpunkt*) to prevent the dissipation of the attack. 'The focal point will be established at the given point by the massing of fire there, by setting in motion a narrow and deeply organized shock force, and by following it up with reserves.'[45]

The idea of 'building a main effort,' expressed in German as *schwerpunktbildung*, was an important concept in their doctrine, reflecting the transient nature of the main effort. F. O. Miksche, an officer in the Czech Army

and one of the first to attempt to articulate the theory behind the Blitzkrieg, wrote in his 1942 book, *Attack*,

> The Germans believe in concentrating powerful forces against narrow frontages. The point for their thrust is provisionally chosen, and the direction of this thrust, before battle. But a constant change of thrust-point [*schwerpunkt*] occurs in the course of the battle's development. . . . This gives the German attack . . . one of its main characteristics. . . .[46]

Miksche said the 'movement of a *Schwerpunkt* is a continual seeking for the weakest point of resistance, in order to attack them with local superiority.'[47] It implied a local superiority gained and maintained throughout the battle, and had the advantages of diverting the attention of the defender, maintaining superiority of the attacker, and deceiving the opponent as to the main effort.[48]

The idea of a *schwerpunkt* was not limited to the attack. According to Major General von Mellenthin,

> In the defense it is the same as in the attack, you must have in your defense a schwerpunkt. That means a place where you think is the most dangerous point for the enemy to come through. At this place you have to concentrate <u>all</u> of your artillery fire, <u>all</u> of your AT guns and so on. You have to be clear cut in your decisions-where is the danger point?-and there you must put <u>most</u> of your forces.[49]

The concept of *schwerpunkt* remains in the doctrine of the German Bundeswehr in very similar form. The September 1987 edition of the *Truppenfuhrung (Command and Control of Armed Forces)* says,

> <u>A point of main effort</u> [*Schwerpunkt*] is to be established in every engagement. . . .
>
> . . . . . .
>
> The point of main effort is to be established where the major commander seeks to bring about the decision of the engagement or where he expects it to fall. . . .
>
> . . . . . .
>
> The point of main effort is primarily

> established and shifted by concentrated forces and massing fire.[80]

The emphasis in the German concept of main effort is on concentrating one's own forces to attack an enemy concentration, or center of gravity. The German doctrine calls for concentrating at the decisive point at the latest time possible, with the concentration conducted rapidly.

Soviet Doctrine . . .

Soviet military thought is known to have been influenced heavily by Clausewitz and Jomini, both before and after the Russian Revolution. V.I. Lenin described Soviet thinking as '[h]aving an overwhelming superiority of forces at the decisive moment and at the decisive point - this 'law' of military success is also the law of political success. . . .'[81]

Current Soviet writings indicate that this influence continues today. Reznichenko, writing in the 1984 edition of *Taktika*, cites the importance of this principle in the Great Patriotic War.

> The experience of wars and postwar exercises shows that one of the most important conditions for successful accomplishment of a combat mission in an offensive is the **decisive concentration of efforts on the main axis at the decisive moment.**
>
> The axis of the main attack must assure surprise and create favorable conditions for concentrating and deploying subunits, the execution of maneuver, rapid advance to areas whose capture will disrupt the stability of the enemy's defenses, and timely accomplishment of the combat missions.[82]

Reznichenko's writings indicate the influence not only of Clausewitz and Jomini, but also of the German developers of 'blitzkrieg' tactics.

USMC Doctrine . . .

The concept of *schwerpunkt* is a key component of the maneuver warfare doctrine of the U. S. Marine Corps. Mr. William S. Lind, in his *Maneuver Warfare Handbook* which describes USMC tactics, says,

> Tactics is a process of combining two elements, techniques and education, through three mental 'filters' or reference points - mission-type orders, the focus of effort or Schwerpunkt, and the search for enemy surfaces and gaps. . . .[83]

Mr. Lind translates schwerpunkt as 'focus of main effort' to avoid confusion with a point on the map. It is a medium for getting all supporting elements of a unit to focus its power on the same objective, an enemy weak point.

> Schwerpunkt is not just the main attack (though the main attack is often at the Schwerpunkt). It is a conceptual focus, not just a physical one. . . . Each [commander] makes sure his actions support the Schwerpunkt.
>
> The Schwerpunkt can also be understood as the harmonizing element or medium through which the contracts of the intent and mission are realized. it pulls together the efforts of all subordinates and guides them toward the goal, toward the result their commander wants.[84]

General A. M. Gray, Marine Corps Commandant, recognized the importance of this concept in Fleet Marine Force Manual (FMFM) 1. 'Of all the efforts going on within our command, we recognize the focus of effort as the most critical to success.'[85] The focus of effort is assigned to one unit, and all other units support it. Every commander is required to establish a focus of effort. It becomes the way of expressing the commander's intent. It enables the commander to focus 'effort

against *critical enemy vulnerabilities*, exercising strict economy elsewhere."[86]

The Marine concept of 'focus of effort' is directly linked to *schwerpunkt*. It represents a logical development based on the history of the World Wars and the increased lethality of weapons.

CHAPTER 4. THEORY IN U. S. ARMY DOCTRINE

> The best strategy is always to be very strong; first in general, and then at the decisive point."
>
> Carl von Clausewitz[87]

Early Influence of Theory and The Principles of War . . .

While the current FM 100-5 may be the first to directly acknowledge the role of theory in the development of U.S. Army doctrine, it does not represent the beginning of the influence of theory in our doctrine. Civil War leaders, particularly on the Confederate side, were deeply influenced by Jomini. Clausewitz's writings, on the other hand, were virtually unknown in the United States until after the Civil War. By the start of the 20th Century Clausewitz was widely read and interpreted in most western armies, including the U.S. Army.

The increasing influence of Clausewitz's theories is particularly evident in the writings of German Generals Alfred von Schlieffen, and Colmar von der Goltz, and French General Ferdinand Foch. All read and quoted Clausewitz extensively, but each failed to grasp the significance of the theorist's writings.

General Foch's principle of 'economy of forces', which he defined as "throwing of *all* one's forces at a given time on one point. . . ."[88] reflected his

perception of Clausewitz's view of center of gravity. Unfortunately, Foch did not read Clausewitz closely enough. He did not comprehend the sense of throwing the enemy off balance. He also failed to heed the warning about the consequences of inconclusive attacks and the strength of the defense.[59]

World War I, with the high casualties and ineffective mass attacks, cast a shadow on the continuing validity of Clausewitz's writings (as interpreted before the war) in the context of modern war. Major-General J. F. C. Fuller and B. H. Liddell Hart challenged Clausewitz's theories, proposing new ones to predict strategy and tactics for the next war. They exerted considerable influence during the interwar years on the German, British, Russian and American armies.

Fuller was most influential immediately after World War I. Believing, like Jomini, that war was a science, he proposed eight 'Principles of War' that became the basis for the principles of war adopted by the U.S. Army in 1921.[60] Fuller discussed the importance of decisive points, defined as the 'place where a decision can be gained,' and indicated that they must be distinguished from an objective. Two of his principles, economy of force and concentration,[61] reflect the idea of massing against a decisive point.

Liddell Hart introduced his 'strategy of the indirect approach' in the 1920s.[62] This idea, which influenced German armored commanders Guderian and Rommel in World War II, called for the use of mechanized forces and air power to strike the enemy by indirect means. The

appropriate targets, the enemy tactical and strategic rear, can be likened to Jomini's decisive points. Striking such a point implies economy of force and mass, and is related to Fuller's principles.

The principles of war developed by Fuller remained a part of our doctrine during World War II, and continue in the doctrine today with minor changes. The 1986 edition of FM 100-5 includes the definitions and explanations for the nine principles of war recognized by the U.S. Army. They are a reflection of the influence of Clausewitz, Jomini, and the modern theorists, and have been tempered by the experience of the Second World War.

According to FM 100-5 the purpose of mass is to '[c]oncentrate combat power at the decisive place and time.'[63] Taken with the other principles of war, massing one's forces '. . . may enable numerically inferior forces to achieve decisive campaign and battle outcomes.'[64]

Closely related to mass, in a sense the antithesis, is the principle of economy of force, to '[a]llocate minimum essential combat power to secondary efforts.'[65] This principle requires that risks be taken in some sectors in order to ensure the preponderance of support to the main effort.

Main Effort . . .

Although the term center of gravity does not appear in U.S. Army doctrine manuals prior to the 1986 FM 100-5, the concept of main effort was well known prior to World War II. *Infantry In Battle*, a 1939 tactics manual written at the Infantry School includes a passage on the

importance and purpose of a main effort. The use of 'main effort' in this text is similar in many respects to the German concept of *schwerpunkt* as a concentration of force.

> All means . . . are concentrated for the decisive stroke. . . . To make the main effort a real knockout blow, economy of force elsewhere may have to be extreme.[66]

Infantry In Battle articulates another point, one that is often confused in the current discussions of center of gravity. The book states that the main effort is applied against an enemy weakness, a decisive point. This is a reflection of Liddell Hart's 'indirect approach'. The book leaves out the vital step of hitting the enemy's source of strength.

> To determine the location for his principal effort, the leader seeks to discover the enemy's weakness. The flanks and rear of an enemy being weak points, he will strike at these when they can be reached. . . . Having made his choice, the leader's dispositions must correspond to his scheme of maneuver. The density of deployment is greater where the main effort is to be made. . . . All available fire support is concentrated to assist the main effort.[67]

The 1939 edition of FM 100-5, *Tentative Field Service Regulations: Operations*, included a definition of main effort. 'In each tactical grouping, the mass of the available means of combat is concentrated in a *main effort*. It is applied in the decisive direction.'[68] The manual cautions against allowing the attack to dissipate.

> The manual also discusses the 'main attack.' The main attack is characterized by narrow zones of action, by reinforcement of artillery and heavy infantry weapons, by successive concentration of fires on critical objectives, and by proper timing in the engagement of tanks and reserves.[69]

When the commander could not determine the proper location for his main attack he was to retain sufficient reserves to give him freedom to act. This included retaining tanks in the reserve, and centralizing control of his artillery.[70]

The 1941, 1944, and 1949 editions of FM 100-5 used the same descriptions and definitions of main attack and main effort as the 1939 edition.[71] In the 1954 edition, however, there is a decided change in the emphasis given to the concept. A separate section is devoted to 'main attack'.

> The main attack seizes the principle objective or destroys the enemy force. Main attacks are characterized by overwhelming concentration of fires. . . . The momentum of the attack is maintained until the objective is captured.
>
> The bulk of combat and logistic support is disposed to favor the main attack in order to develop and sustain the maximum combat power at the decisive point.[72]

In the 1962 edition of FM 100-5, main effort is mentioned only in terms of its role in an envelopment.[73] The term was omitted from the 1968 and 1976 editions. In the 1982 edition a 'clearly designated main effort' is one of seven AirLand Battle fundamentals.[74] The main effort is assigned to the 'force responsible for the most dangerous sector in the MBA [main battle area]. . . ' and that force normally receives priority of fire support.[75] In the 1986 edition main effort is an AirLand Battle imperative. In fact, four of the ten AirLand Battle imperatives are related to the idea of main effort.

A check of division and lower level manuals from 1939 to 1962 revealed that the concept of main effort and

main attack were not incorporated into tactical doctrine at the small unit level. They are commonly mentioned in manuals prescribing tactical doctrine in the U.S. Army today. There is, however, little agreement among the manuals as to the definitions and distinctions between the two terms.

FM 101-5-1, *Operational Terms and Symbols*, defines the terms together as the '. . . principal [sic] attack or effort into which the commander places the bulk of the offensive capability at his disposal. An attack directed against the chief objective of the campaign or battle.'[76] There is no distinction between the terms.

FM 100-15, *Corps Operations*, includes a section on main and supporting attacks. It uses the terms main attack and main effort interchangeably, describing what they should accomplish rather than what the terms mean.[77] FM 71-100, *Division Operations*, says '[t]he main effort is assigned to only one unit.' It describes the conditions and means for shifting the main effort if '. . . the unit assigned the main effort encounters unexpected difficulties or a supporting attack meets with unexpected success. . . .'[78]

FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force*, indicates the terms main effort and main attack are not synonymous. 'The main attack is that task force's main effort at the decisive phase of the attack. The main effort is the focus of combat power at any given time during the attack.'[79] This definition comes closest to the German *schwerpunkt*, and is reminiscent of Clausewitz's center of gravity.

FM 7-72, *The Light Infantry Battalion*, includes the AirLand Battle Imperative main effort, but does not use the term in the procedures described. Neither does it describe how to implement the imperative. It indicates that units must concentrate ". . . rapidly to overwhelm enemy forces at the point of attack. . . ."[80]

Vulnerabilities . . .

Several times in this study the idea of attacking enemy vulnerabilities has surfaced. A vulnerability is a point "susceptible to physical attack."[81] Attacking vulnerabilities is often confused with attacking an enemy's center of gravity. They are not synonymous. A center of gravity is always a point of strength while a vulnerability may have little to do with the overall strength of the enemy.

This notion reminds one of Jomini's idea of a decisive point as a point where a decision might be reached. To Jomini this decisive point was the objective for aiming your concentration.

The 1982 edition of FM 100-5 emphasized the idea of hitting enemy vulnerabilities. The manual said these had to be "critical units and areas whose loss will degrade the coherence of enemy operations. . . . Destruction of the opposing force is achieved by throwing the enemy off balance with powerful blows. . . ."[82]

The notion of attacking vulnerabilities was continued in the 1986 edition of FM 100-5, and is now an AirLand Battle imperative. Commanders are expected to shift the main effort to locate or create enemy vulnerabilities.[83]

Synchronization . . .

The 1986 edition of FM 100-5 makes synchronization a Tenet of AirLand Battle. "Synchronization is the arrangement of battlefield activities in time, space and purpose to produce maximum relative combat power at the decisive point."[84] The relation of this tenet to main effort and decisive points is striking. In fact, there is a theoretical basis for the term. Clausewitz and Jomini both understood the importance of time and space in concentrating their forces.[85]

The inclusion of this term in the doctrine reflects the growing complexity of battlefield management. Battlefield dispersion has increased dramatically since World War I, continuing a phenomenon begun with the Industrial Revolution. Achieving a concentration of forces has become extremely difficult and dangerous at all levels of war.

Chaim Herzog offers this example of the danger of concentration at the tactical level during the Yom Kippur War. In the initial assault of the war, an infantry division in the Egyptian Third Army was held off a position for over half an hour by a single Israeli soldier. He inflicted heavy casualties on the Egyptian units that tried to take his position.[86] This author has observed similar results at the U. S. Army's National Training Center. The increased lethality of weapons has strengthened the defense considerably.

To counter the threat, commanders must synchronize their combat power in time and space. This includes an impressive array of weapons systems: fixed and rotary

wing aircraft, air defense artillery, long and short range field artillery, mortars, tanks and anti-tank direct fire systems, electronic warfare assets, maneuver units, and individual weapons.

Center of Gravity . . .

The term 'center of gravity' does not appear in our doctrine at any level prior to the 1986 edition of FM 100-5. Colonel Huba Wass de Czege, one of the authors of the 1986 edition, said the concept of center of gravity was included in the doctrine for two reasons. First, a study of successful military leaders indicated that they used a thought process that caused them to ask 'from where or from what does the enemy draw his strength.'[87]

The second reason for inclusion of the term was that the 1982 version of the manual had caused confusion with its concept of attacking vulnerabilities. It was felt that the use of center of gravity would be helpful in keying on vulnerabilities that were useful in defeating the enemy.[88]

FM 100-5 defines a center of gravity as 'that characteristic, capability, or locality from which the force derives its freedom of action, physical strength, or will to fight. . . .Its attack is . . . the focus of all operations.'[89] The manual cites a number of examples of what a modern tactical center of gravity might be. It could

> . . . be a component of the field force-the mass of the enemy force, the boundary between two of its major combat formations, a vital command and control center, or perhaps its logistical base or lines of communications.[90]

CHAPTER 5. HISTORICAL CASE STUDIES

> Far from believing we have discovered a new technique, we are merely providing a rationale for the actions of every general in history, which serves to explain their connection with the nature of the problem.
>
> Carl von Clausewitz[21]

There are many historical examples of battles in which an army or unit failed to mass against an enemy, and for that reason met defeat. Most of these are studied as examples of strategy or operational art. This study is about the tactical level of war. While documentation for tactical centers of gravity are not as common as at the operational level, they nevertheless do exist. Two such case studies will be examined here as discussion points for the utility of the concept of a tactical center of gravity.

The Battle of Schmidt . . .

In November 1944, the 28th Infantry Division, V (US) Corps, was assigned the mission to capture the German town of Schmidt, a crossroads village that overlooked the Roer River (see Map 1, p. 40). The 28th's attack was to be a supporting attack for First Army's main attack to be conducted by VII (US) Corps. It was the only attack conducted by V Corps or First Army. The division was given the mission along with explicit instructions from corps on how the division's regiments would be employed.[22]

The 28th had three infantry regiments assigned, the 109th, 110th and 112th. The division received considerable reinforcement for the mission. In particular, the division received the 1171st Engineer

Combat Group, consisting of 3 battalions. In addition to the division's own artillery, a 155mm battery (selfpropelled) and a 105mm battalion were in direct support.[83] This gave the division 4 battalions of 105mm and 1 battalion plus a battery of 155mm.

The division was told to employ the 109th Infantry in an attack to secure the northern flank of the main attack, and to secure a line of departure for First Army's scheduled main attack.[84] The 110th Infantry was to conduct a supporting attack through a dense woods south of the main attack to secure roads that would eventually be needed to supply the forces in Schmidt.[85]

The 112th Infantry was assigned the mission of taking Schmidt. The regiment was required to seize the town of Vossenack with a supporting attack of one battalion. Two battalions in column would launch a main attack through the Huertgen Forest, across the Kall River, capture the town of Kommerscheidt, and then capture Schmidt. The regiment also was required to protect its own north flank as it was moving divergent to the 109th. The battalion had priority of fires and air support (weather limited availability of air support throughout the operation).[86]

The initial plan called for 2nd Battalion to attack to capture Vossenack and 1st Battalion to attack on the south through the woods, cross country to the Kall River, to take Kommerscheidt. The 3rd Battalion was to follow the 1st Battalion and take Schmidt on order.[87]

The 28th Division was opposed by the *275th Infantry Division*. The Germans expected an attack, and had ample

reserves in the area, but were not particularly well prepared for the attack. In addition to the reserves, the Germans had the ability to quickly move forces from less active sectors. As this was the only active sector along the front, the Germans were able to move forces with impunity. The Americans apparently were not aware of the criticality of the Schwammenauel Dams to the Germans. These dams had the capability to flood the entire Roer Valley.[99]

The attack was launched on 2 November 1944. The 2nd Battalion attack went well, and by late afternoon the battalion was in Vossenack.[99] The 1st Battalion's attack stalled. Artillery support for this attack was poorly coordinated and the battalion met stiff resistance in the rough terrain.[100] When the 3rd Battalion attack was stopped, the 28th Division directed the 112th Regiment to shift its main effort to 2nd Battalion, which was having considerable success.[101] The attacks of the 109th and 110th Regiments failed to achieve their objectives.[102]

The next day the 112th's 2nd Battalion continued to hold Vossenack. The 3rd Battalion assumed the main effort, passed through Vossenack, and seized Kommerscheidt.[103] The 1st Battalion followed behind, but due to a confusion in orders did not go beyond Kommerscheidt.[104] The 3rd Battalion captured Schmidt late on the 3 November, and holding it for the next three days in a desperate struggle. The lead battalions were destroyed piecemeal by the Germans in Kommerscheidt and Schmidt and along the Kall Trail. Poor organization of engineer support and security on the 112th's lines of

communications prevented tank support from reaching the infantry.[106]

In the end, the division lost Schmidt and Kommerscheidt, and was forced back virtually to the line of departure.[106] Neither the 109th or 110th Regiments made significant progress in their sectors.[107] Eventually the 28th was relieved in place.[108]

The Battle of Schmidt is a good case study for the importance of the concept of main effort and center of gravity. Although the 1st (and later the 3rd) Battalions were designated the main effort, it is evident that they were not a main effort in the sense of FM 100-5. Merely designating a main effort does not constitute creation of one. The battalions of the 112th were committed piecemeal. Fire, engineer, and service support were not adequately weighed in favor of the initially designated main effort. Nor were they shifted to the 3rd Battalion when it assumed the main effort. None of the battalions was given the support required to deliver a strong blow.

The 28th's failure to create and support a main effort does not mean it did not have a center of gravity. According to Clausewitz, there is always a center of gravity, located where the forces are concentrated most densely.[109] By default, the 28th Division's center of gravity was the isolated force holding Schmidt.

The German main effort was aimed at isolating the American forces east of the Kall River. They formed their main effort from the reserve troops that were readily available in the area. They targeted their efforts at two decisive points; the Kall Trail (although

they were slow to cut the trail), and the forces holding at Kommerscheidt. These objectives weakened the American forces in Schmidt. The Germans then defeated the American main effort in Schmidt. The reserve divisions constituted a center of gravity for the Germans.

The key points that are brought out in terms of center of gravity are this: First, when the main effort shifts, the entire plan must shift to support the new plan. Task organization must reflect the main effort, and when the effort switches the task organization must change to reflect that change. Once the effort shifted, little attention was focused on the new requirements for engineer support brought on by the key role of the Kall Trail. There was a long period when no one was in charge. The 28th Division Commander did not seem to grasp the importance of the trail to holding Schmidt.

Second, assigning the division two distinct missions at a time when this was the only action on the entire First Army front allowed the enemy to focus his main effort in one place without risk. It also forced the 28th to conduct two main attacks and one supporting attack simultaneously. They were unable to build a real main effort in these conditions.

Third, the intelligence failures point to the difficulty at the tactical level of targeting the enemy's center of gravity. The division was not informed about the critical nature of the dams, and about the extra German division in the area. However, this information was available to the division from V Corps and First Army. Had the division staff thought in terms of center

of gravity, they might have sought the needed information to identify it.

In this example, each side did have a center of gravity. Each was capable of being targeted by the other side. A key idea behind Clausewitz's analogy of center of gravity is the notion of a blow. This idea is carried forth in the concept of main effort. To be effective a main effort must be a powerful force assembled and directed at a specific target, the enemy's center of gravity. The Germans correctly targeted the American center of gravity. The Americans failed to target the German's center of gravity. Had the commanders on either side applied the concept it appears it would have been helpful in focusing their efforts.

The Battle for East Falkland . . .

On 21 May 1982 British marines from the 3 Commando Brigade landed at San Carlos, East Falklands, to begin the land portion of the campaign to reclaim the Falkland Islands (see Map 2, p. 41).[110] Four days after landing, and after securing the port of San Carlos against light resistance, the marines began the march across the island to Port Stanley, the main Argentine stronghold on the island.[111] The loss of the HMS *Conveyor* on 25 May,[112] and her cargo of Chinook helicopters meant that for most of the marines this operation would be on foot.

The British planned to conduct the main attack along a northern axis by way of Douglas and Teal Inlet to attack Port Stanley. A supporting attack would move along the southern axis and take Darwin and Goose Green, then join in the main attack at Port Stanley.[113]

The 2 Para Battalion, Parachute Regiment took Goose Green on 29 May after heavy fighting against a superior foe in what was essentially an economy of force role.[114] 45 Commando occupied Douglas unopposed on 29 May and 3 Para Battalion similarly occupied Teal Inlet on the north coast of the island.[115] By 4 June 3 Commando Brigade was in position in the mountains surrounding Port Stanley.[116] The British had reinforced the 45 Commando Regiment with the 42 Commando Regiment, delivered to the Mount Kent area by the remaining helicopters.[117]

The 3 Brigade launched their initial attack on Port Stanley on 11 June.[118] With reinforcements from 5 Brigade they launched the final attack on 13 June and the Argentineans defending the city surrendered at 2100 on 14 June.[119] This essentially ended the conflict.

The British developed a tactical center of gravity for the land campaign. It was always the Commando units. Loss of the Chinooks did not affect their ability to fight and win, although it did delay the outcome. Even the loss of the remaining aircraft would not have affected the outcome. The British properly took risk with the Goose Green operation. Had this attack failed it would have been a political blow, but would not have significantly altered the main battle for Port Stanley.

The British center of gravity could have been targeted by the Argentineans. Through intelligence and command failures they failed to identify or target it. Had they done so, they could have seriously attrited the British before the commando units reached Port Stanley.

They defended at Goose Green and Port Stanley, but much like Confederate General Pemberton at Vicksburg, they chose to react to events rather than shape them. The advantages of time for the defender only accrue if the defender uses them. Throughout the British march across the island they were vulnerable to both air and land attack by the Argentineans. Very little effort was made to attrite British forces or even slow their advance. The final attack on Port Stanley was anticlimactic. Again, all the advantages of the defender were wasted.

The Argentineans did not develop a main effort. Their forces in Port Stanley represented a center of gravity. This center of gravity was never given the direction or power needed to target the British forces. However, the Argentinians in Port Stanley were successfully targeted by the British, and their defeat ended the war.

On each side there was a center of gravity that was capable of being targeted. In the case of the British it was targeted with good results. Had both sides used the concept, the outcome on East Falklands Island (although probably not the war) would have been very different.

The Falklands War, in this writer's opinion, pitted a modern, well trained force (albeit a small one) against a lethargic army that was designed more to preserve internal order than to fight a pitched battle. The war was fought in an undeveloped theater, with neither the British nor the Argentinians mobilizing or deploying to their full military capability. There were periods of intense combat, particularly on the sea, but for the most

part the war was fought at a relatively low level of intensity when compared to the Yom Kippur War or the Second World War. The lessons from this war appear to be more applicable in the low intensity conflict arena than a mechanized war. As in the earlier example of Schmidt, they point up the advantages of forming and maintaining a center of gravity.

CHAPTER 6. TACTICAL CENTER OF GRAVITY IN AIRLAND BATTLE

> Identification of the enemy's center of gravity and the design of actions which will ultimately expose it to attack and destruction while protecting our own, are the essence of the operational art.
>
> FM 100-5[120]

A Working Definition . . .

Discounting Clausewitz's use of the term to describe the relationship of battle to war, we can come up with two probable definitions of center of gravity. First, it is a main concentration of forces. Clausewitz says we should use our center of gravity to attack the enemy's. 'A major battle in a theater of operations is a collision between two centers of gravity; the more forces we can concentrate in our center of gravity, the more certain and massive the effect will be.'[121]

Second, Clausewitz said a 'center of gravity' is a source of strength, but in this case, not necessarily the main concentration of forces. The discussion that follows the definition of the center of gravity as the 'hub of all power and movement' implies that the objective is to throw the enemy off balance by hitting him at the very source of his strength.[122] While one may be able to get at his enemy's strength by striking

through a vulnerability, he must always aim to throw the enemy off balance at his source of strength.

While these distinctions and definitions may not totally clarify the concept of center of gravity, they do help us understand what Clausewitz meant when he used the term. It also helps to look at the term in the context of the levels of war. Clausewitz saw the concept differently at the strategic and tactical levels.

In Book Eight, 'War Plans', Clausewitz discusses center of gravity at the strategic level of war, military and political. It is here that he develops the idea of the 'hub of all power'.[123] This definition of center of gravity gives us the most trouble.

The definition of center of gravity in FM 100-5 is a clear departure even from Clausewitz's broadest definition of the concept as the 'hub of all power.' While the manual accepts that the center of gravity is a source of strength or balance, it offers as examples things that are often weaknesses. One example of this is the 'key economic resource.' Cutting off the supply of a resource can hardly be expected to destroy an enemy force. There are too many sources that cannot be controlled.

Historically, blockades and embargoes do not work as well, and certainly not as fast, as the planners would wish. Often a country will actually grow stronger as a result, developing alternate sources or substitute products for the resource. FM 100-5 errs in the loose interpretation of center of gravity.

At the tactical level Clausewitz puts the emphasis on the center of gravity as the main concentration of force. Again, FM 100-5 gives this a much looser interpretation, citing a key command post or key terrain as possible centers of gravity for tactical formations. The manual cites the mass of the enemy forces, a unit boundary, command and control centers, and lines of communications as possible centers of gravity for a component of a field force.

Some writers trace the looser interpretation of center of gravity to Miksche's *Attack: A Study of Blitzkrieg Tactics*. Miksche translated *schwerpunkt* as thrust point,[124] and as Schneider and Izzo said "he parenthetically equates an objective with the concept of *schwerpunkt*."[125] FM 100-5 appears to confuse center of gravity and decisive points.[126] Of the examples offered in the manual, only the mass of force could be considered a source of strength. The other examples are vulnerabilities, and decisive points.[127] Destruction of one of them will not of itself cause the defeat of the enemy force.

At the tactical level the center of gravity will almost always be a concentration of forces. For friendly forces it will be the main effort, and the ability to form and shift that effort during the battle. For the enemy it will be the same; his main effort or his ability to constitute a main effort.

The Concept in AirLand Battle . . .

AirLand Battle is the U.S. Army's fighting doctrine. The doctrine "is based on securing or retaining the

initiative and exercising it aggressively to accomplish the mission.'[128] The four tenets of AirLand Battle, initiative, agility, depth and synchronization express the base requirements for achieving success in generating and applying combat power at operational and tactical levels.[129] The tenets guide the employment of the tactical center of gravity. It is important to understand the tenets in order to understand how the concept can support AirLand Battle doctrine at the tactical level.

FM 100-5 defines initiative as setting the terms of battle. It calls for decentralized decision authority that encourages junior leaders to act independently, and take risks. It requires anticipation of events hours and days in advance. Main effort is a means of conveying commanders intent to lower levels. It gives the '. . . critical path of concentration and priorities'[130] needed by junior leaders to exercise initiative.

Agility is the ability to act faster than your opponent. It requires leaders to quickly analyze situations and make decisions without complete information.[131] Subordinate leaders are more apt to make good decisions if they clearly understand the commanders intent. Center of gravity is a means of conveying that intent, both by designating and developing a main effort,[132] and by identifying targeting the enemy's center of gravity.

Depth refers to 'the extension of operations in space, time and resources. . . . Momentum in the offense and elasticity in the defense derive from depth.'[133]

Centers of gravity, or main efforts, must be created throughout the battlefield, at each echelon, and covering the each element of the battlefield framework (close, deep, rear, security and reserve).

Synchronization in AirLand Battle refers to "the arrangement of battlefield activities in time, space and purpose to produce maximum relative combat power at the decisive point."[134] The importance of synchronization was discussed in Chapter 4.

These tenets provide the ingredients for success on the AirLand Battle. The AirLand Battle imperatives prescribe the key operating requirements. Four of these are derivatives of the concept of center of gravity as embodied in the term main effort. They are: ensure unity of effort; concentrate combat power against enemy vulnerabilities; designate, sustain, and shift the main effort; and conserve strength for decisive action.

> Commands must not only ensure unity of effort within their own organizations, but must also promote it with supporting and supported elements as well as with sister services and allies. . . . A main effort is always clearly designated. . . . All actions . . . are performed so as to ensure the success of the main effort.
>
> Concentrating combat power against enemy vulnerabilities is . . . fundamental to AirLand Battle operations. . . .
>
> The main effort is assigned to the element with the most important task to accomplish within the commander's concept. . . . If conditions change . . . the commander shifts his main effort to another force.
>
> Successful commanders conserve the strength of their forces to be stronger at the decisive time and place.[135]

Mass (manueuver, fires and support), economy of force, synchronization (battlefield operating systems), and direction (commander's intent) are the ingredients for main effort. Properly combined, or synthesized, they can equal a tactical center of gravity, what Clausewitz called, '. . . the blow from which the broadest and most favorable repurcussions can be expected.'[136] Designating a main effort and weighing it with the preponderence of support puts the bulk of combat power at the decisive point,[137] thereby throwing the enemy off balance at his center of gravity.

The term 'main effort' has definite utility in our doctrine and should be standardized in all of our manuals. Its meaning should be differentiated from main attack. I suggest that a variation of the definitions used in FM 71-2[138] be adopted. The main attack is the unit's main effort at the decisive phase of the attack. The main effort is the focus of combat power at any given time during the attack. The main effort changes with the situation, requiring synchronization throughout the battle.

The use of main effort in our doctrine is based solely on its relationship to our force. In the classical meaning main effort equates to center of gravity, and is not only the blow, but the target as well. As seen from the above case studies, it is possible to detect and target a center of gravity for an enemy force at the tactical level. The concept has definite utility for tactical commanders provided we use the narrower definition of the term as the source of the

enemy's strength. This is normally some element of the enemy forces. Unfortunately, 'center of gravity' has acquired considerable baggage from its current definition in FM 100-5.

Dr. Harold R. Winton has suggested that we may need a new term to describe the effect we desire. He suggests 'critical component.'[139] Like center of gravity, a blow at a 'critical component' would disrupt the enemy's balance. In many ways this term is an improvement over Clausewitz's analogy. There is no restriction on the number (there can be more than one). It is easier to understand. Its name infers its importance. One drawback is that it does not recognize the shifting nature of a center of gravity.

Whatever term we use to describe the concept, we must recognize the concept in our doctrine and it utility at the tactical level.

CHAPTER 7. CONCLUSIONS AND RECOMMENDATIONS

> Know the enemy and know yourself; in a hundred battles you will never be in peril.
>
> Sun Tzu[140]

As Clausewitz said, 'we have [not] discovered a new technique.'[141] It is something good commanders have practiced for as long as there have been wars. The key is to be stronger than the enemy at the decisive time and place; to overwhelm the enemy so as to throw him off balance and prevent his bringing his center of gravity to bear on yours. That is even more important today than it was during the Napoleonic era about which Clausewitz wrote.

The time is long past when armies could afford to take the field and attack enemy forces head on. If the theory of the battle of annihilation was ever valid, it certainly is not today. Modern weapons deliver a lethal rate of fire. In a matter of hours whole units can be destroyed in such head on engagements. The Yom Kippur War, which was the instigation for the modernization of U.S. Army doctrine, proved the strength of a well coordinated defense armed with modern weapons.

We must use theory and our own peculiar experience in war to develop and train with the tactical doctrine that will enable us to fight and win, whether outnumbered or not, with the minimal loss of life and expenditure of resources. AirLand Battle is such a doctrine. It incorporates many theoretical and practical concepts that have been proven in training and in combat. The tenets provide a means for achieving success in generating and applying combat power at operational and tactical levels. The comments of Schneider and Izzo concerning the application of the tenets to operational art apply equally at the tactical level.

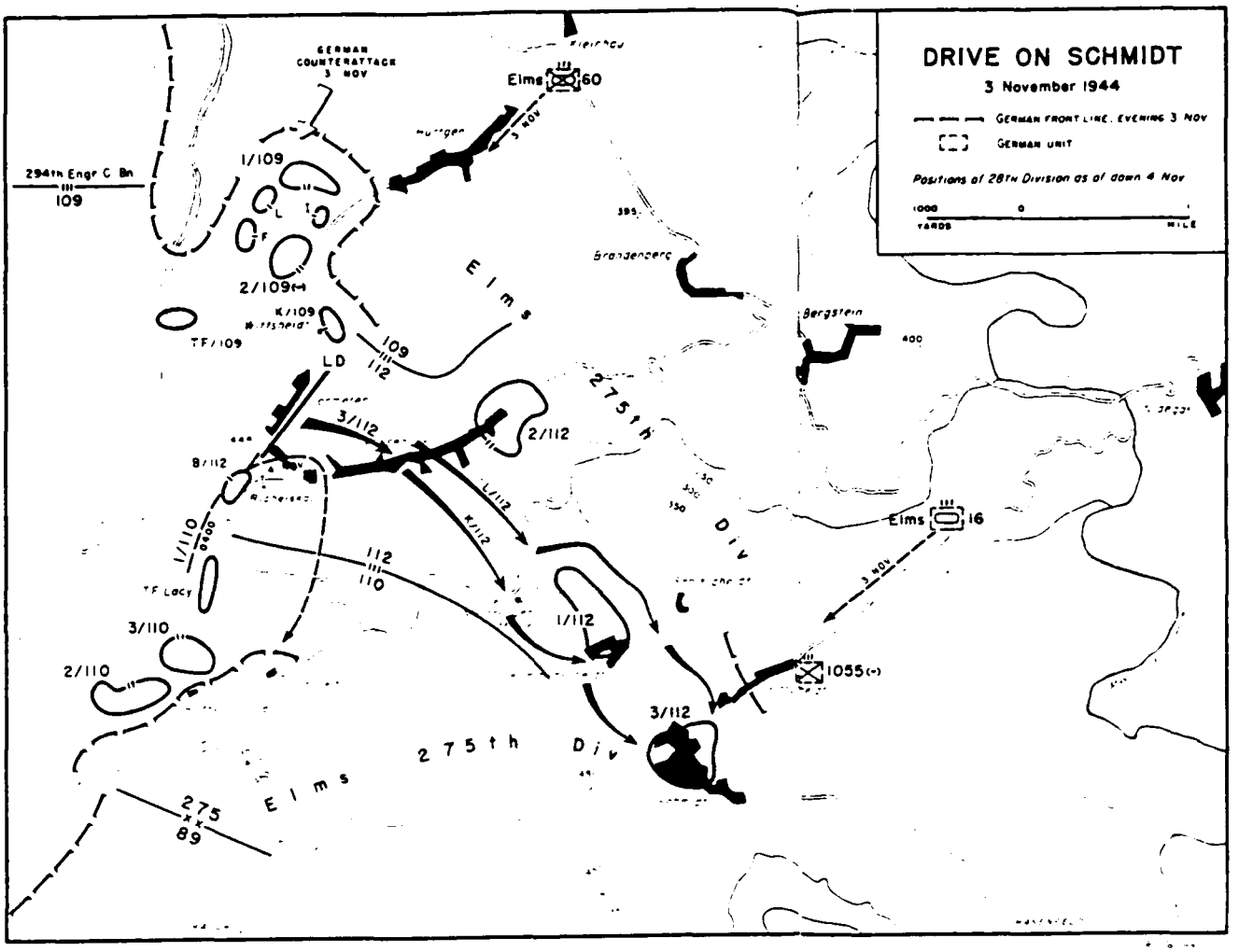
> But the essence of operational art is the avoidance of these head-on collisions. The operational artist seeks to maneuver dispersed. He swarms to create a center of gravity faster than his opponent (*agility*). He creates this concentration of combat power at a decisive point and time (*synchronization*). After the blow is delivered he quickly disperses in preparation for the next encounter. His forces continue the maneuver of swarm-fight-disperse sequentially and simultaneously throughout the *depth* of the theater of operations. The cumulative victories of each encounter, governed by an overall strategic framework, serve to set the terms of the operations and so maintain the *initiative*.[142]

The U.S. Army's use of the concept of main effort is solidly based in the theory of Clausewitz's center of gravity (the main concentration of force). While the concept is not as well developed in our doctrine as the German *schwerpunkt*, the term is widely used and accepted. It must be given an standard definition and incorporated into the new edition of FM 100-5 and all of derivative doctrine manuals.

The term center of gravity itself has utility at all levels of war in terms of the identification of that element of the enemy's combat power that is most key to his balance. At the operational level the writers of FM 100-5 chose to begin with the least precise definition of center of gravity, the 'hub of all power' rather than the main concentration of force. By including examples of decisive points as probable centers of gravity they have confused the user of the term even more. Where they have applied it to the tactical level, they have carried this 'loose' definition along.

The new version of this manual must orient on the classical meaning of the term. This will give tactical and operational level commanders and their staffs a tool they can use to bring the battle into focus.

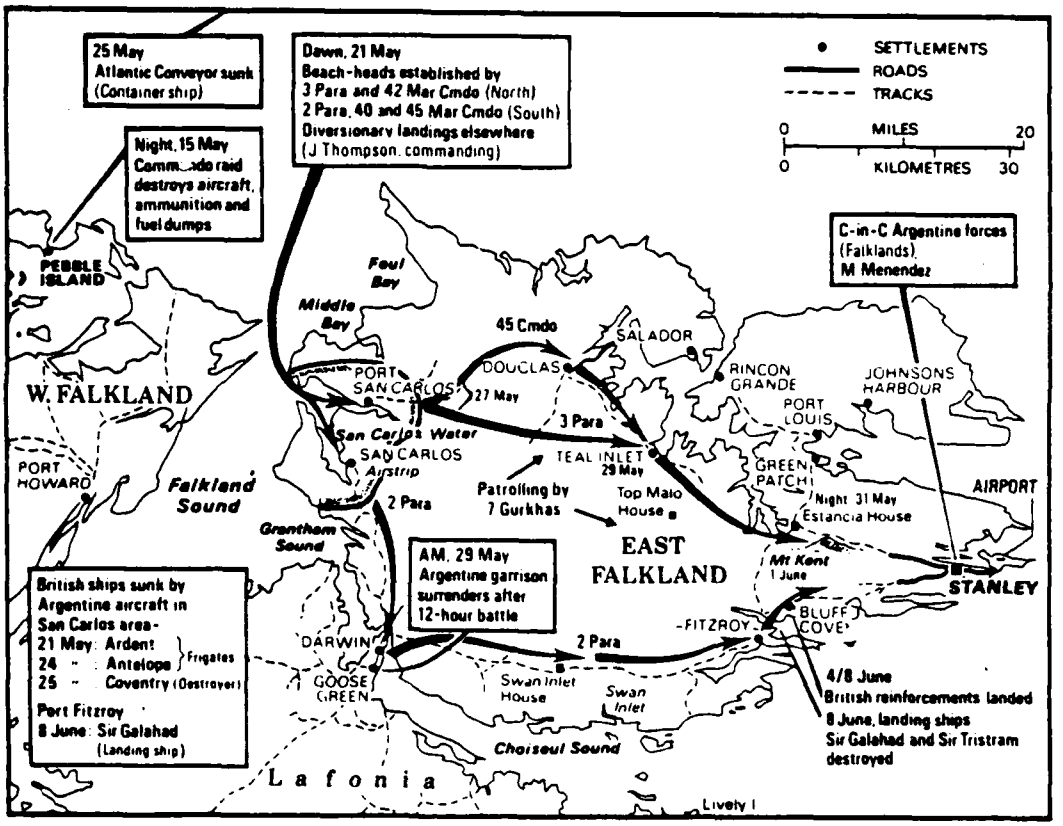
MAP 1. BATTLE OF SCHMIDT [1]



MAP 21

[1]Map copied from Charles B. MacDonald and Sidney T. Mathews, *Three Battles: ARNAVILLE, ALTUZZO, AND SCHMIDT*. (Washington, D. C.: GPO, 1952), pp. 278-279.

MAP 2. BATTLE OF EAST FALKLAND[2]



The Two-Pronged Attack towards Port Stanley

---

[2]Map copied from Max Hastings and Simon Jenkins, *The Battle for the Falklands*, (New York: W. W. Norton & Co., 1983), p. 201.

ENDNOTES

1. Carl von Clausewitz, *On War*, ed. and trans. by Michael Howard and Peter Paret (Princeton: Princeton Univ. Press, 1984), p. 141.

2. Department of the Army Field Manual (FM) 100-5, *Operations*, (Washington: GPO, 1986) p. 179. Hereafter cited as FM 100-5.

3. Ibid, p. 180.

4. See Major Michael R. Matheny, "The Development of The Theory and Doctrine of Operational Art in the American Army, 1920-1940," SAMS Monograph, (Fort Leavenworth, KS: USACGSC, 1988), for a discussion of the influence of the theorists on doctrine.

5. See James J. Schneider and Lawrence L. Izzo, "Clausewitz's Elusive Center of Gravity," XVII *Parameters* (Sep 87), pp. 46-57; Col. Lloyd J. Matthews (USA Ret.), "On Clausewitz," 38 *Army* (Feb 88), pp. 20-24; and Colonel Huba Wass de Czege, "Clausewitz: Historical Theories Remain Sound Compass Reference; The Catch is Staying on Course," 38, *Army*, (Sep 1988), pp. 37-43.

6. See Clausewitz, pp. 248, 485-486, and 595-596.

7. Compare Clausewitz pp. 487 and 595-596 with p. 486.

8. FM 100-5, p. 179.

9. Ibid.

10. Ibid.

11. Ibid, p. 9-11.

12. Colonel Lloyd J. Matthews (USA Ret.), "On Clausewitz," 38, *Army*, (Feb 1988), p. 20.

13. FM 100-5, p. 180.

14. Clausewitz, pp. 485-486.

15. Ibid, p. 617.

16. David G. Chandler, *The Campaigns of Napoleon*. (New York: MacMillan, 1966), p. 141.

17. Frederick W. C. Lieder, Ph.D. and Ray Waldron Pettengill, Ph.D., *Manual of Military German*, (Cambridge: Harvard Univ. Press, 1918) pp. 329 and 337. This interpretation of the

etymology of *schwerpunkt* was verified with Colonel Ulrizh Quante, German LNO to CAC, in an interview on November 9, 1989.

18. Dr. Otto Springer, ed., *Langenscheidt New Murat-Sanders Encyclopedic Dictionary of the English and German Languages*, (Berlin: Langenscheidt, 1974).

19. Telephone interview with Dr. Dan Hughes, U.S. Army Combined Arms Center Historian, November 2, 1989. Dr. Hughes has studied Clausewitz extensively, to include making an informal translation of *Vom Krieg*. See also Herbert Rosinski, *The German Army*, (Washington, D. C.: Infantry Journal, Inc., 1944), p. 187.

20. Schneider and Izzo, p. 46.

21. Clausewitz, p. 75.

22. Ibid, p. 485.

23. Ibid, p. 75.

24. Ibid, p. 485.

25. Ibid.

26. Ibid, pp. 485-486.

27. Ibid, 486.

28. Ibid, p. 487.

29. Ibid, pp. 595-596.

30. Ibid, p. 596.

31. Ibid, p. 248.

32. Compare Clausewitz, pp. 485-486 and pp. 595-596.

33. Herbert Rosinski, *The German Army*, (Washington, D. C.: Infantry Journal, Inc., 1944), p. 187.

34. Antoine-Henri Baron de Jomini, *The Art of War*, trans. by G. H. Mendell, and W. P. Craighill, (Westport, Conn.: Greenwood Press, Inc., 1971, orig. pub. 1862), p. 70.

35. Ibid.

36. Schneider and Izzo, p. 56.

37. Clausewitz, p. 258.

38. Ibid, p. 195.

39. Ibid, p. 194-197.

40. Hermann Foertsch, *The Art of Modern Warfare*, trans. by Theodore W. Knauth, (New York: Veritas Press, Inc., 1940), p. 73.

41. Jomini, pp. 85-88.

42. Ibid, p. 88.

43. Field Marshal Erwin Rommel, *Attacks*, (Vienna, VA: Athena Press, Inc., 1979), p. 247.

44. Major General Heinz Guderian, "Armored Forces", 44, *The Infantry Journal Reader*, (1937), p. 253. Cited in CGSC Reprint.

45. Foertsch, p. 201.

46. Major F. O. Miksche, *Attack: A Study of Blitzkrieg Tactics*, trans. by Tom Wintringham, (New York: Random House, 1942), p. xvi. Miksche translates *schwerpunkt* as 'thrust-point'. His translator explains in the introduction that while a dictionary translation would be 'center of gravity' or 'point of principal effort', he does not feel either of "these terms fits the meaning the word has acquired in German military literature. In his later work, *Atomic Weapons and Armies*, Miksche used this same translation in the chapter titled "The Blitzkrieg" (p. 60). As will be seen later in the study of the origins of center of gravity in U.S. Army doctrine, this translation has contributed to the confusion over the meaning of the term.

47. Ibid, p. 42.

48. Ibid, pp. 41-44.

49. Major General Friedrich von Mellenthin. Quoted in "Armored Warfare in World War II," Battelle Columbus Labs Tactical Technology Center Study, 10 May 1979, p. 34.

50. German Army Regulation 100/100, *Command and Control of Armed Forces*, (September 1987) (HDv 100/100 VS-NfD, *Truppenfuhrung)*, p. 7-12.

51. V. G. Reznichenko, ed., *Taktika* [Tactics], trans. by CIS Multilingual Section Translation Bureau, Sec. of State Dept., Ottawa, Canada (Moscow: 1984), p. 48.

52. Ibid, p. 79.

53. William S. Lind, *Maneuver Warfare Handbook*, (Boulder, CO: Westview Press, Inc., 1985), p. 12.

54. Ibid, p. 18.

55. Department of the Navy, Hq, U.S. Marine Corps, Fleet Marine Force Manual (FMFM) 1, *Warfighting*, (Washington, D.C.: GPO, 1989), p. 72.

56. Ibid.

57. Clausewitz, p. 204.

58. General Ferdinand Foch, *The Principles of War*, trans. by J. de Morinni, (New York: H. K. Fly Co., 1918), pp. 50-51.

59. Jehuda L. Wallach, 'Misperceptions of Clausewitz' *On War* by the German Military,' in Michael I. Handel (ed.), *Clausewitz and Modern Strategy*, (London: Frank Cass and Co., 1986), p. 221.

60. Jay Luvaas, 'Clausewitz, Fuller and Liddell Hart,' in Michael I. Handel (ed.), *Clausewitz and Modern Strategy*, (London: Frank Cass & Co., 1986), pp. 199-200.

61. Major-General J. F. C. Fuller, *Armored Warfare*, (Harrisburg, PA: The Military Service Pub. Co., 1943), pp. 11, 97.

62. B. H. Liddell Hart, *Strategy*, (New YorK: Praeger Pub., Inc, 1967), p. 350.

63. FM 100-5, p. 174.

64. Ibid.

65. Ibid, 174-175.

66. U. S. Army Infantry School, *Infantry In Battle*, (Washington, D. C.: The Infantry Journal, Inc., 1939), p. 55.

67. Ibid.

68. DA, FM 100-5, *Tentative Field Service Regulations: Operations*, (Washington, D. C.: GPO, 1939), p. 129.

69. Ibid, p. 133.

70. Ibid.

71. DA, FM 100-5, *Field Service Regulations: Operations*, (Washington D.C.: GPO, 1941), p. 98. DA, FM 100-5, *Field Service Regulations: Operations*, (Washington, D.C.: GPO, 1944),

p. 110. DA, FM 100-5, *Field Service Regulations: Operations*, (Washington, D.C.: GPO, 1949), p. 81.

72. DA, FM 100-5, *Field Service Regulations: Operations*, (Washington, D. C.: GPO, 1954), p. 87.

73. DA, FM 100-5, *Field Service Regulations: Operations*, (Washington, D.C.: GPO, 1962), p. 64.

74. DA, FM 100-5, *Operations*, (Washington, D. C.: GPO, 1982), p. 7-2. Hereafter cited as FM 100-5 (1982).

75. Ibid, p. 11-7.

76. FM 101-5-1, *Operational Terms and Symbols*, (Washington, D. C.: GPO, 1985), p. 1-8.

77. FM 100-15, *Corps Operations*, (Washington, D. C.: GPO, 1989), pp. 5-27, 6-17.

78. FM 71-100, *Division Operations*, (Washington, D. C.: GPO, 1988), p. 4-11.

79. FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force*, (Washington, D. C.: GPO, 1988), p. 3-25.

80. FM 7-72, *Light Infantry Battalion*, (Washington, D. C.: GPO, 1987), pp. 1-3, 3-1, 4-3 to 4-4.

81. William Morris, ed., *The American Heritage Dictionary of the English Language*, (Boston: American Heritage Pub. Co., Inc., 1973), p. 1438.

82. FM 100-5 (1982), p. 2-1.

83. FM 100-5, p. 23-24.

84. Ibid, p. 17.

85. Clausewitz, pp. 204-209 and Jomini, p. 70.

86. Chaim Herzog, *The Arab-Israeli Wars*, (New York: Random House, 1984), p. 242.

87. Colonel Huba Wass de Czege, "Clausewitz: Historical Theories Remain Sound Compass Reference; The Catch is Staying on Course," 38, *Army*, (Sep 1988), p. 42.

88. Ibid.

89. FM 100-5, p. 179.

90. Ibid.

91. Clausewitz, p. 486.

92. Charles B. MacDonald and Sidney T. Mathews, *Three Battles: ARNAVILLE, ALTUZZO, AND SCHMIDT*. (Washington, D. C.: GPO, 1952), pp. 251-253.

93. Ibid, pp. 253-255.

94. Ibid, pp. 253-254.

95. Ibid, p. 254.

96. Ibid.

97. Ibid, pp. 257-259.

98. Ibid, pp. 255-257.

99. Ibid, pp. 259-268.

100. Ibid, pp. 268-271.

101. Ibid, p. 271.

102. Ibid, pp. 271-271.

103. Ibid, pp. 276, 279.

104. Ibid, pp. 283-284.

105. For a full account of the struggle see MacDonald, pp. 276-392.

106. Ibid, pp. 302 and 374-378.

107. Ibid, pp. 315-317 and 339.

108. Ibid, p. 414.

109. Clausewitz, pp. 485-487.

110. Max Hastings and Simon Jenkins, *The Battle for the Falklands*, (New York: W. W. Norton & Co., 1983), p. 200.

111. Ibid, pp. 237-238.

112. Ibid, pp. 227 and 231.

113. Ibid, pp. 231-232.

114. Ibid, pp. 233-253.

115. Ibid, p. 264.

116. Ibid, pp. 266-267.

117. Ibid, pp. 264-266.

118. Ibid, p. 292.

119. Ibid, pp. 300-312.

120. FM 100-5, p. 180.

121. Clausewitz, p. 489.

122. Ibid, p. 596.

123. Ibid.

124. Miksche, p. xvi.

125. Schneider and Izzo, p. 52.

126. Ibid.

127. Ibid.

128. FM 100-5, p. 14.

129. Ibid.

130. General William E. DePuy, "Concepts of Operation: The Heart of Command, The Tool of Doctrine," 38, *Army*, (August 1988), 31.

131. FM 100-5, p. 16.

132. DePuy, p. 31.

133. FM 100-5, p. 16.

134. Ibid, p. 17.

135. Ibid, p. 23-25.

136. Clausewitz, p. 485.

137. This idea came from a personal interview with LTC L. W. Bentley, Canadian Exchange Officer, U.S. Army Combined Arms Center, 9 August 1989.

138. FM 71-2, p. 3-25.

139. Personal interview with Dr. Harold R. Winton, Deputy Director, School of Advanced Military Studies (SAMS), November 8, 1989.

140. Sun Tzu, *The Art of War*, trans. by Samuel B. Griffith, (New York: Oxford Univ. Press, 1963), p. 84.

141. Clausewitz, p. 486.

142. Schneider and Izzo, p. 57.

BIBLIOGRAPHY

BOOKS

Aron, Raymond, *Clausewitz: Philosopher of War*, trans. by Christine Booker and Norman Stone. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1985.

Chandler, David G., *The Campaigns of Napoleon*. New York: Macmillan Pub. Co., 1966.

von Clausewitz, Carl, *On War*, ed. & trans. by Michael Howard and Peter Paret. Princeton: Princeton University Press, 1984.

Foch, General Ferdinand, *The Principles of War*, trans. by J. de Morinni. New York: H. K. Fly Co., 1918.

Foertsch, Colonel Hermann, *The Art of Modern Warfare*, trans. by Theodore W. Knauth. New York: Veritas Press, 1940.

Fuller, Major-General J. F. C., *Armored Warfare*. Harrisburg, PA: The Military Service Pub. Co., 1943.

German Army Regulation 100/100, *Command and Control of Armed Forces* (HDv 100/100 VS-Nfd, *Truppenfuhrung*). Bonn: The Federal Minister of Defense, 1987.

von der Goltz, Colmar Baron, *The Conduct of War*, trans. by Joseph T. Dickman. Kansas City, MO: The Franklin Pub. Co., 1896.

Hart, B. H. Liddell, *Strategy*. New York: Praeger Pub., Inc., 1967.

Hastings, Max and Jenkins, Simon, *The Battle for the Falklands*. New York: W. W. Norton & Co., 1983.

Herzog, Chaim, *The Arab-Israeli Wars*. New York: Random House, 1984.

de Jomini, Baron Antoine-Henri, *The Art of War*, trans. by G. H. Mendell and W. P. Craighill. Originally pub. 1862. Reprint ed., Wesport, CT: Greenwood Press Pub., 1971.

Lieder, Frederick W. C. and Pettengill, Ray Waldron, *Manual of Military German*. Cambridge: Harvard Univ. Press, 1918.

Lind, William S., *Maneuver Warfare Handbook*. Boulder, CO: Westview Press, Inc., 1985.

MacDonald, Charles B. and Matthews, Sidney T., *Three Battles: ARNAVILLE, ALTUZZO, AND SCHMIDT*. Washington, D. C.: GPO 1952.

von Mellenthin, Major General F. W., *Panzer Battles*, trans. by H. Betzler, ed. by L. C. F. Turner. Norman, OK: University of Oklahoma Press, 1956.

Miksche, F. O., *Atomic Weapons and Armies*. New York: Frederick A. Praeger, Inc., 1955.

Miksche, F. O., *Attack: A Study of Blitzkrieg Tactics*, trans. by Tom Wintringham. New York: Random House, 1942.

Morris, William, ed., *The American Heritage Dictionary of the English Language*. Boston: American Heritage Pub. Co., Inc., 1973.

Paret, Peter, *Clausewitz and the State*. Princeton, NJ: Princeton Univ. Press, 1985.

Reznichenko, V. G., ed., *Taktika [Tactics]*, trans. by CIS Multilingual Section Translation Bureau, Sec. of State Dept., Ottawa, Can. Moscow: 1984.

Rommel, Field Marshal Erwin, *Attacks*. Vienna, VA: Athena Press, Inc., 1979.

Rosinski, Herbert, *The German Army*. Washington, D. C.: The Infantry Journal, Inc., 1944.

Springer, Dr. Otto, ed., *Langenscheidt New Murat-Sanders Encyclopedia Dictionary of the English and German Languages*. Berlin: Langenscheidt, 1974.

Sun Tzu, *The Art of War*, trans. by Samuel B. Griffith. New York: Oxford Univ. Press, 1963.

U. S. Army Infantry School, *Infantry In Battle*. Washington, D. C.: The Infantry Journal, Inc., 1939.

Wallach, Jehuda L., *The Dogma of the Battle of Annihilation*. Westport, CT: Greenwood Press, 1986.

ARTICLES AND PERIODICALS

DePuy, General William E., "Concepts of Operation: The Heart of Command, The Tool of Doctrine," 38, *Army*, (August 1988), 26-40.

Galloway, Lieutenant Colonel Archie, "FM 100-5: Who Influenced Whom?," LXVI, *Military Review*, (March 1986), 46-51.

Glanz, Colonel David M., "Operational Art and Tactics," LXVIII, *Military Review*, (December 1988), 32-40.

Guderian, Heinz, "Armored Forces," Originally published in *The Infantry Journal* in two parts, vol. 44, no. 5, Sep-Oct 1937, pp. 418-21, and Nov-Dec 1937, pp. 522-28. Citations are from CGSC Reprint for Course P613, (1989) p. 238-254.

Hall, Major Wayne M., "A Theoretical Perspective of AirLand Battle Doctrine," LXVI, *Military Review*, (March 1986), 32-43.

Holder, Lieutenant Colonel L. D., "A New Day for Operational Art," 35, *Army*, (Mar 1985), 22-32.

Izzo, Lieutenant Colonel (Promotable) Lawrence L., "The Center of Gravity Is Not an Achilles Heel," LCVIII, *Military Review*, (January 1988), 72-77.

Luvaas, Jay, "Clausewitz, Fuller and Liddell Hart." In Michael I. Handel, ed., *Clausewitz and Modern Strategy*. London: Frank Cass & Co., Ltd., 1986. 197-212.

Matthews, Colonel Lloyd J., "On Clauswitz . . . ," 38, *Army*, (Feb 1988), 20-24.

Romjue, John L., "AirLand Battle: The Historical Background," LXVI, *Military Review*, (March 1986), 52-55.

Schneider, James J. and Izzo, Lawrence L., "Clausewitz's Elusive Center of Gravity," XVII, *Parameters*, (September 1987), 46-57.

Wallach, Jehuda L., "Misperceptions of Clausewitz' *On War* by the German Military." In Michael I. Handel, ed., *Clausewitz and Modern Strategy*. London: Frank Cass & Co., Ltd., 1986. 213-239.

Wass de Czege, Colonel Huba, "Clausewitz: Historical Theories Remain Sound Compass References: The Catch is Staying on Course," 38, *Army*, (Sep 1988), 37-43.

MANUSCRIPTS AND MONOGRAPHS

Betson, Major William R., "Centers of Gravity, Lines of Operations, and the Normandy Campaign." School of Advanced Military Studies (SAMS) Monograph. Fort Leavenworth, KS: U.S. Army Command and General Staff College (USACGSC), 1987.

Boyd, Colonel John, "Patterns of Conflict," Proceedings of Seminar on Air Antitank Warfare. May 25-26, 1978.

Doughty, Major Robert A., "The Evolution of US Army Tactical Doctrine, 1946-76." Leavenworth Paper No. 1. Fort Leavenworth, KS: USACGSC, 1976.

Franz, Colonel W., "Large Unit Maneuver or Operations Above Division." Unpublished manuscript. Undated.

Gribling, Major Richard H., "The Yom Kippur War: Insights into Operational Theory." SAMS Monograph. Fort Leavenworth, KS: USACGSC, 1988.

Griswold, Major Myron J., 'Considerations in Identifying and Attacking the Enemy's Center of Gravity.' SAMS Monograph. Fort Leavenworth, KS: USACGSC, 1986.

Herbert, Major Paul H., 'Deciding What Has to be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations.' Leavenworth Papers No. 16. Fort Leavenworth, KS: USACGSC, 1988.

House, Major John M., 'Do Doctrinal Buzzwords Obscure the Meaning of Operational Art?' SAMS Monograph. Fort Leavenworth, KS: USACGSC, 1989.

Kriwanek, Major Thomas M., 'The Operational Center of Gravity.' SAMS Monograph. Fort Leavenworth, KS: USACGSC, 1986.

Lupfer, Timothy T., 'The Dynamics of Doctrine: The Changes in German Tactical Doctrine During the First World War.' Leavenworth Papers No. 4. Fort Leavenworth, KS: USACGSC, 1981.

Matheny, Major Michael R., 'The Development of the Theory and Doctrine of Operational Art in the American Army, 1920-40.' SAMS Monograph. Fort Leavenworth, KS: USACGSC, 1988.

McDonough, LTC James R., 'War in the Falklands: The Use and Misuse of Military Theory.' Army Operational Studies Fellowship (AOSF) Monograph. Fort Leavenworth, KS: USACGSC, 1988.

von Mellenthin, Major General Friedrich, Battaile Laboratories Study, 1970.

Romjue, John L., 'From Active Defense to AirLand Battle: The Development of Army Doctrine 1973-1982.' TRADOC Historical Monograph Series. Fort Monroe, VA: USA Training and Doctrine Command, 1984.

Schneider, James J., 'The Theory of Operational Art.' Draft, 2 ed. 1 March 1988.

Swain, Colonel Richard M., Unpublished letter to editor of *Army* magazine, dtd 28 Aug 1988.

Vanderbeek, Major Walter A., 'The Decisive Point: The Key to Victory.' SAMS Monograph. Fort Leavenworth, KS: USACGSC, 1988.

Viale, Lieutenant Colonel Charles R., 'A Conversation at the Club: Another Analysis of the Concept of Center of Gravity.' SAMS Monograph. Fort Leavenworth, KS: USACGSC, 1988.

INTERVIEWS

Bentley, Lieutenant Colonel L. W. Personal interview with Canadian Exchange Officer to U.S. Army Combined Arms Center (CAC), 9 August 1989.

Hughes, Dr. Dan. Telephone interview with CAC Historian, 2 November 1989.

Quante, Colonel Ulrizh. Personal interview with German Army LNO to CAC, 9 November 1989.

Winton, Dr. Hal. Personal interview with Deputy Director, SAMS, 8 November 1989.

GOVERNMENT PUBLICATIONS

Department of the Army (DA), Field Manual (FM) 7-72, *Light Inf. Battalion.* Washington, D. C.: GPO 1987.

DA, FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force.* Washington, D. C.: GPO, 1988.

DA, FM 71-3, *The Armored and Mechanized Infantry Brigade.* Washington, D. C.: GPO, 1988.

DA, FM 71-100, *Division Operations. Washington, D. C.: GPO, 1988.*

DA, FM 100-5, *Field Service Regulations: Operations.* Washington, D. C.: GPO, 1941.

_____ 1944.

_____ 1949.

_____ 1954.

_____ 1962.

_____ *Operations.* Washington, D. C.: GPO 1976.

_____ 1982.

_____ 1986.

DA, FM 100-5, *Tentative Field Service Regulations: Operations.* Washington, D. C.: GPO, 1939.

DA, FM 100-15, *Corps Operations.* Washington, D. C.: GPO, 1989.

DA, FM 101-5-1, *Operational Terms and Symbols.* Washington, D. C.: GPO, 1985.

Department of the Navy, HQ, U.S. Marine Corps, Fleet Marine Force Manual (FMFM) 1, *Warfighting.* Washington, D. C.: GPO, 1989.